

**METHOD AND APPARATUS PROVIDING
DATA OFFLOADING AND CARRIER
AGGREGATION ASSOCIATED
MEASUREMENT REPORTING**

TECHNICAL FIELD

[0001] The exemplary and non-limiting embodiments of this invention relate generally to wireless communication systems, methods, devices and computer programs and, more specifically, relate to heterogeneous network (HetNet) deployments, data offloading, small cells, mobility, user equipment (UE) measurements and reporting, UE idle and connected modes and to enhanced diverse data application (EDDA) operation.

BACKGROUND

[0002] This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued, but are not necessarily ones that have been previously conceived, implemented or described. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in this application and is not admitted to be prior art by inclusion in this section.

[0003] In current 3GPP study items related to HetNet mobility it has become apparent that future networks will require a number of small cells (small relative to a macro cell in which the small cells may be located) to be deployed in order to cope with the expected increase in demand for higher data rates and faster connections. To achieve a workable solution the small cells need to be detected by the UE and reported to the network in order to gain the benefits that can be realized from the deployment of the small cells.

SUMMARY

[0004] In a first aspect thereof the exemplary embodiments of this invention provide a method that comprises operating a user equipment in a macro cell and selectively, based on at least one criterion, at least one of measuring or not measuring a small cell located within the macro cell, and transmitting or not transmitting a measurement report for the small cell to a wireless network.

[0005] In a further aspect thereof the exemplary embodiments of this invention provide an apparatus that comprises at least one data processor and at least one memory that includes computer program code. The at least one memory and computer program code are configured, with the at least one data processor, to cause the apparatus, when a user equipment is operated in a macro cell of a wireless network, to selectively, based on at least one criterion, at least one of measure or not measure a small cell located within the macro cell, and transmit or not transmit a measurement report for the small cell to the wireless network.

[0006] In another aspect thereof the exemplary embodiments of this invention provide a method that comprises determining at a wireless network a current operational state of a user equipment that is located within a macro cell of the wireless network, where the macro cell contains at least one small cell; and based at least on the determined current operational state of the user equipment, making at least one of a small cell measurement decision, a small cell measurement reporting decision, and a small cell handover decision for the user equipment.

[0007] In yet another aspect thereof the exemplary embodiments of this invention provide an apparatus that comprises at least one data processor and at least one memory that includes computer program code. The at least one memory and computer program code are configured, with the at least one data processor, to cause the apparatus to determine at a wireless network a current operational state of a user equipment that is located within a macro cell of the wireless network, where the macro cell contains at least one small cell and, based at least on the determined current operational state of the user equipment, to make at least one of a small cell measurement decision, a small cell measurement reporting decision, and a small cell handover decision for the user equipment.

[0008] In yet another aspect thereof the exemplary embodiments of this invention provide a method that comprises operating a user equipment with at least one component carrier and, based on at least one criterion, selectively at least one of performing measuring or not performing measuring of a component carrier other than a component carrier with which the user equipment is currently operating, and transmitting or not transmitting a measurement report for a measured component carrier to a wireless network.

[0009] In yet one further aspect thereof the exemplary embodiments of this invention provide an apparatus that comprises at least one data processor and at least one memory including computer program code. The at least one memory and computer program code are configured, with the at least one data processor, to cause the apparatus to operate a user equipment with at least one component carrier and, based on at least one criterion, selectively at least one of perform measuring or not perform measuring of a component carrier other than a component carrier with which the user equipment is currently operating, and transmit or not transmit a measurement report for a measured component carrier to a wireless network.

[0010] In still another aspect thereof the exemplary embodiments of this invention provide an apparatus that comprises means for operating a user equipment in a macro cell; and means for selectively, based on at least one criterion, at least one of measuring or not measuring a small cell located within the macro cell, and transmitting or not transmitting a measurement report for the small cell to a wireless network.

[0011] In one further aspect thereof the exemplary embodiments of this invention provide an apparatus that comprises means for determining at a wireless network a current operational state of a user equipment that is located within a macro cell of the wireless network, where the macro cell contains at least one small cell; and means, responsive to at least on the determined current operational state of the user equipment, for making at least one of a small cell measurement decision, a small cell measurement reporting decision, and a small cell handover decision for the user equipment.

[0012] In yet one further aspect thereof the exemplary embodiments of this invention provide an apparatus that comprises means for operating a user equipment with at least one component carrier; and means, responsive to at least one criterion, selectively at least one of performing measuring or not performing measuring of a component carrier other than a component carrier with which the user equipment is currently operating, and transmitting or not transmitting a measurement report for a measured component carrier to a wireless network.